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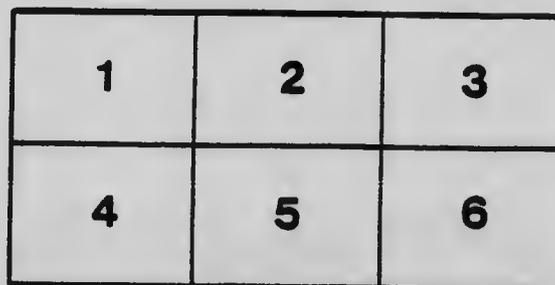
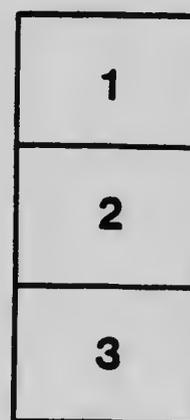
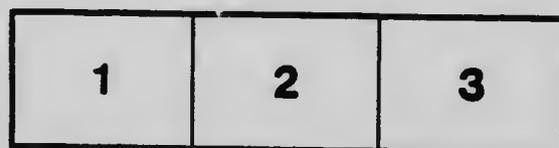
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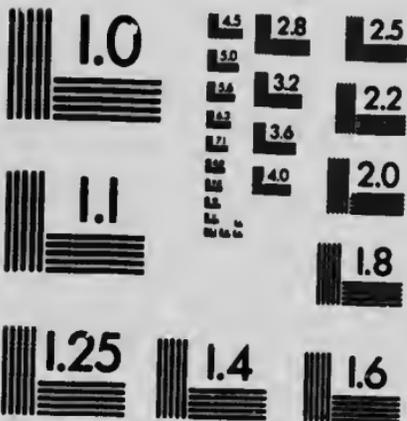
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DEPARTMENT OF AGRICULTURE OF THE PROVINCE OF QUEBEC
HORTICULTURAL SERVICE
JANUARY, 1918

BULLETIN No. 48

BEAN CULTURE

— BY —

J.-H. LAVOIE
Chief of the Horticultural Service

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With the Collaboration of
Messrs F. PÉTRAZ & EUG. COUTON
Inspectors in Horticulture

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BEAN

PHASEOLUS VULGARIS L. OR KIDNEY OR FRENCH BEAN

French : Haricot Commun

(Fruit vegetable belonging to the family of the papilionaceous leguminosae plants)

This annual plant, in all probability native to South America, produces pods containing grains, the form, color and number of which differ according to varieties and which constitute, together with potatoes and wheat, the base of the nourishment of popular classes.

Division as regards consumption

We eat either the seeds or the fruit complete, according as the pods are *membranous* or not. In the first case, they must be shelled in order to consume only the seeds: whence the name of *shell beans*. In the latter case, the whole pod must be consumed when the seeds are about formed: whence the name of *edible podded beans*.

It follows that beans may be grown to be eaten either green or dry (1).

String beans are not very nutritious, but are agreeable to taste, light to the stomach, so that they are convenient even for convalescent persons.

Shelled beans are eat green or dry. In both cases, seeds possess, owing to their richness in azote and fecula, eminently nutritive properties (2). They have however the inconvenience of being flatulent (3).

- (1) The culture of beans is divided into four parts as regards consumption, viz:
- 1o *string beans* consumed when the pods are young before seeds have formed;
 - 2o *edible podded beans* the whole pods of which are consumed as soon as grains have formed, but before they begin to harden;
 - 3o *green shell beans* only the green seeds of which are consumed when they reach a certain size;
 - 4o *dry shell beans* harvested when completely ripe and the use of which is known to everybody.
- (2) The azoted substance of beans is called *legumine*.
- (3) "The light mealy substance wherein Eolus confines himself!"
- Discorde, while accusing beans of causing nightmares, says somewhere else that they are propitious to love! Let bachelors take note of it.....

Division as regards characters of vegetation

The stalks of certain varieties become slender, long and climbing, so that they must be provided with supports or poles: whence their name of *pole varieties*. To the contrary, the stalk of others remains short, stiff, keeping one's self up: they are called *bush varieties*.

Each of these two groups comprises numerous varieties some of which are particularly suited to the production of string beans while others are more recommended for the production of dry beans.

Although bush varieties give a smaller yield than pole varieties, they



FIG. 1.—“Planet Jr” Seeder No. 20.

nevertheless have over the latter the advantage of being more precocious and of necessitating no props. Also, bush beans are more particularly suited for *field crops* than *pole* beans whose mode of cultivation is rather expensive and which are, from this fact, rather pertaining to the *garden*.

I.—BUSH BEANS FOR FIELD CULTIVATION.

(for the production of dry seeds)

Importance of this culture

The eminently nutritious properties of the bean (1), the enormous consumption

(1) COMPOSITION AND NUTRITIOUS VALUE OF BEANS COMPARED WITH THOSE OF A FEW OTHER FOOD PRODUCTS

DESIGNATION	Water	Asoted matters	Hydrocarbonated matters	Fats	Number of calories per pound
	%	%	%	%	
String or snap beans.....	89.2	2.3	7.4	0.2	195
" " shelled.....	88.9	9.4	29.1	0.6	740
Dry beans.....	12.6	22.5	59.6	1.8	1605
Potatoes.....	78.3	2.2	18.4	0.1	895
Rolled Oats.....	7.7	16.7	66.2	7.3	1848
Lean beef.....	70.0	21.3	7.9	799
Eggs.....	73.7	14.8	10.5	720

(Extract from Farmers' Bulletin No. 221.—U. S. A.)

made of it, its relative scarcity and the high prices it commands; its rapid growth, the facility with which it can be cultivated, stored, handled and shipped, finally its improving qualities as plant, should induce our agriculturists to devote themselves, on a larger scale, to the culture of this indispensable product we have up to now imported in considerable quantities for our own consumption.

In fact, is it known that our crop of dry beans which amounted to 330,000 bushels in 1907, with an average yield of 26.60 per acre, had fallen to 78,000 bushels in 1916, with an average yield of 17.75?

Are we aware of the fact that the city of Montreal only, used to purchase from outside for \$500,000 worth of dry beans yearly and that some were even imported from Germany before the war?

It is true that our production has greatly increased since.

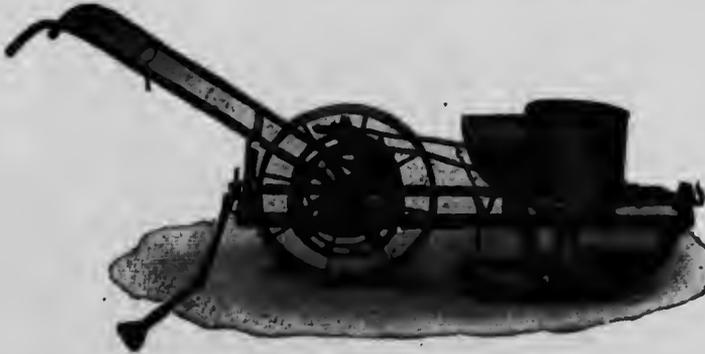


FIG. 2.—“Massey-Harris” Planter.

Thus, from official statistics, the 55,157 acres sown with beans in the spring of 1917 have yielded 841,000 bushels, or 15.25 per acre.

Nevertheless, in spite of this huge growth, we are still far from being in a position to export appreciable quantities; the crop is just what is required for our own supply. And yet it would be more than ever advisable to produce large crops for export: because the demand for this food is so great in Europe, that not only is surproduction not to be feared, but because we will probably not be able to meet requirements, for a long time.

It being given that this culture has become the object of a trade constantly growing in importance and that it shall constitute, within a short time, one of the elements of wealth of several regions in this Province, it is of consequence that we resort to methods and cultural processes most susceptible to have this production reach the yield and quality that will assure remunerative prices.

It is to be hoped that the outline we will give in these few pages, of the methods and processes appearing to us as the most recommendable for this Province, will effectually contribute to the obtaining of the results in view.

Soil

Strictly speaking, beans accommodate themselves of almost any soil, with the exception however of very limy soils as well as those that are too light, damp or cold, which are fatal to them.

Light soils, clay loams, gravelly, rather sandy than clayey, well drained and sufficiently rich in organic matters are those most generally suited to bean crops.

It is in fact acknowledged that beans fear cold and dampness much more than heat and dryness. For this reason we recommend that they should be cultivated preferably in soils that grow warm and drain easily.

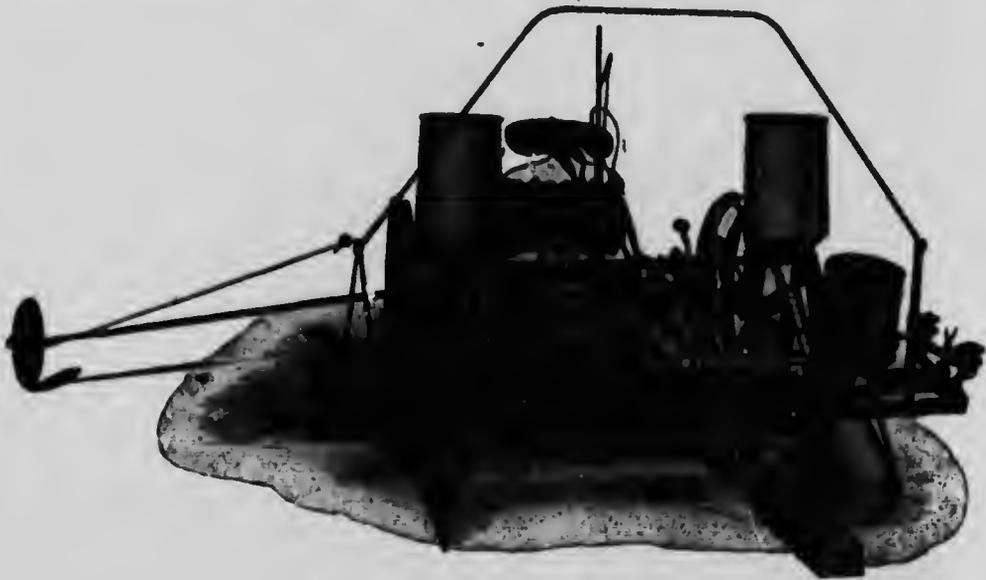


FIG. 3.—“Cockshutt” lantern.

Also will they be grown in clay soils only when the latter have been thoroughly drained and mellowed, otherwise the flowering will be poor, seeds will difficultly mature and their quality will be so much altered as the season will have been rainy (1).

Rotation of crops

Belonging to the family of the Leguminosae the bean possesses the property of fixing the azote of the air through nodosities developing on its roots, so that

(1) Of course, it is obvious that we should not fall in the opposite abuse, or cultivate them in a soil that is too dry; because beans, as any other plant, not only require heat and air, but again a certain amount of moisture, in order to spring up and develop.

Besides, we will see further on that hoeings must be often resorted to so as to keep to the soil its proper degree of moisture. It would consequently be disastrous, particularly in dry weather, to grow beans in a land with a very small retaining capacity.

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it enriches of this element a soil hitherto poor of same. Also, should we logically make it succeed to azote-exhausting crops, such as cereals.

Nevertheless, as the bean is a bettering plant, as it requires much dressing prior and during the vegetation, dressing that enables to clear the soil of noxious weeds, and as it is classed for this reason amongst the cleaning crops, some people take the stand that it should be grown before rather than after a cereal. In so doing, they say, cereals will at the same time benefit of a soil free of weeds and rich in azote; conditions indispensable to them.

Everything depends evidently on the composition and on the state of the soil, on the nature of the rotation practised and followed in the crops.

Being given, however, that farms in this Province are generally infested by weeds, that farmers very seldom plow up the stubble and that they are often short of labor and fertilizers, we would recommend to kill two birds with one stone; to have a bean crop after a potato, cabbage-turnip or beet crop and to have it followed by wheat or another cereal mixed with clover seed. That is, we believe, the best formula to obtain large yields from average crops, and to have the land retain its fertility (1).

Fertilizers

The bean requires a soil sufficiently rich in organic matters or old manure, and this is just the reason why it should follow crops requiring an abundant manuring such as potatoes, beets, cabbage-turnips. If we were to act in this way, it could be grown without a new addition of fertilizers, as the soil would then contain a sufficient reserve of azote.

In case of the contrary, we will dung only with rotten manure, spreading from 6 to 7 tons per acre, and yet this rotten manure will have to be perfectly incorporated to the ground by means of a disk-harrow (2).

(1) This formula could make the following combinations possible:

3 Year Rotation.

1st year: Potato, or Cabbage-
turnip or Beet
2nd " Bean
3rd " Wheat

4 Year Rotation.

1st year: Hoed crops.
2nd " Bean.
3rd " Cereal (mixed with
clover and Timothy.)
4th " Clover.

5 Year Rotation.

1st year: Hoed crops.
2nd " Bean.
3rd " Cereal (mixed with
clover and Timothy.)
4th " Meadow.
5th " Pasture-land.

Rotations recommended in Ontario and the United States.

3 Year Rotation

1st year: Clover.
2nd " Bean.
3rd " Wheat.

4 Year Rotation.

1st year: Clover.
2nd " Corn.
3rd " Bean.
4th " Wheat

(2) It is advisable to remind here that this addition of rotten manure would be suited only to light soils where it would have not only the effect of furnishing the bean with the quantity of azote it requires to come through the critical period, but also to contribute in maintaining in a soil usually dry, a certain dose of moisture.

Besides the amount of azoted fertilizers the bean particularly requires during the 3 or 4 weeks following its germination, that is while awaiting the formation of nodosities on its roots, there must moreover be in the soil, and under assimilable shape, phosphoric acid to hasten the maturity of its fruits and potash to increase the yield and the grade.

Superphosphate of lime (1) or basic slag, applied in the spring at the rate of 400 lbs per acre, will provide the quantity of phosphoric acid most of the soils of this Province, and particularly clay loams, are generally short of.

Sulphate or muriate of potash, spread at the rate of 200 lbs per acre, or



FIG. 4.—“Planet Jr” Double Wheel Hoe No. 11.

failing those, wood ashes, applied in quantities of 500 to 1000 lbs per acre, will exercise, in soils relatively poor in potash and chiefly in *sandy-limy* soils, a most favorable action on the yield and quality of beans comprised amongst “*potash plants*” (2).

The manner in which fertilizers are spread varies with the area of crops and the equipment at our disposal. In field cultivation they may be spread either broad cast or along the furrows. The latter method is by far the most economical as it requires a smaller quantity of plant food. Moreover, those who make use of planters provided with fertilizer spreaders would do nothing better than employ them for this purpose in preference to any other machine. We must not forget, however, that certain fertilizers, such as phosphates and potash salts, must be incorporated to the soil with the spring plowing and not when planting.

(1) *The superphosphate of lime* having a quicker effect (than basic slag) may be spread at the time of plowing preceding the sowing-time; however it could still be given a long time before, at the beginning of the winter for instance (in the fall). The use of the fertilizer too late in the spring may delay its action one year if, after its spreading, dry weather prevails. (Diffloth) “*Sols et Labours.*”

(2) “Let us remember that in the soils rich in potash (loamy soils) lime favors the decomposition and assimilation of this element.” (De V *jet*).

Preparation of the Soil

We will never insist too much on this point, because failures usually originate in the lack of care brought in the digging up and loosening of the soil.

It would be taking useless trouble, time and money thrown away than to sow beans in a soil that would not have received a preparation appropriate to this crop.

This preparation consists in plowing the ground in the fall so that it may benefit of the salutary action of the frost which contributes to its desaggregation, to make it porous, permeable and loose, and to destroy many insects and weeds.

This fall plowing is particularly imperative in the case of lands that are rather heavy (1) than light and must be 8 to 9 inches deep, if the thickness of the coat of arable soil allows it. In case of the contrary, it would be better to break up the sub-soil with a digging harrow and plow to a smaller depth.

In the following spring, as soon as the state of the ground will permit, a plowing of at least 6 inches in depth will have to be executed without delay (2).

After this, the ground will be incessantly submitted to strong harrowings worked lengthwise and crosswise, either with a disk-harrow, a cultivator or a drag harrow, with a view of breaking the clods, of eradicating weeds and perfectly loosening the surface.

As it is extremely important that the evaporation be reduced in order to prevent the soil from drying and hardening, and to destroy weeds as they grow up, subsequent use of the harrow, roller and hoe will be made as often as necessary, at all intervals of about 8, 10 or 12 days, until seeding time has come.

Time of Planting

The bean is extremely sensible to cold and fears very much a too abundant moisture or that lasts too long. In fact, when put in a cold and wet ground most of the seeds rot and others successful in coming up lose their vitality.

Even if they were planted in a soil well dried and warmed up, the spring frost might yet kill all beans that would have come up. It follows that bean seedlings in the open ground cannot be made in the spring, as long as the ground

(1) Although fall plowings are just as recommendable for light soils, they could however be suppressed without too much inconvenience when a soil will have precedently been loosened and cleaned by a previous hoed crop.

(2) If it is advisable to dig in fertilisers that are not lost into the soil, (rotten manures, phosphates, potash salts) they may be very regularly distributed all over the plowed area, under proper weather conditions, and immediately closely incorporated to the soil by means of the disk-harrow.

will not be dry and warm (1) and that the danger of late frosts will not have disappeared.

This time will then differ from one place to another according as the spring will be more or less early and in accordance with the hardiness of bean varieties used. Thus, we will plant earlier around Montreal than in Quebec. Equally, Kidney beans may be planted a few days earlier than Pea beans.

From the results already obtained in the various regions of this Province, the time of planting for beans generally extends from *May 25th to June 5th*.



FIG. 5.—“Planet Jr” Hoe No. 8, with cultivator.

Sowing earlier, pretexting that frosts are no longer to be feared and that the soil is in proper shape, would be running the risk of obtaining stunted plants, predisposed to *rust* and *anthracnose*, of poor yield and uneven ripening.

Choice of seeds: varieties

There are innumerable varieties of bush beans for the production of dry seeds. As this considerable growth in the number of varieties results of breedings made with a view to improve them, we must then conclude that all of them are not strong, hardy and productive to the same extent, that they are more or less early and liable to diseases, that they are not all equally well suited to soils and climates and for consumption.

The choice is then a question for the grower to decide. However, the trying of a new variety will never be attempted otherwise than on a small experiment plot, unless it be well admitted that it is perfectly well suited to his district and to the nature of his ground.

(1) In order that the bean may well germinate and develop, the degree of the temperature of the soil must not be inferior to 48 Fahrenheit degrees.

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The most important thing of all is to plant only seeds that are fully ripe, sound, of uniform size, one year old (1) and coming from pure varieties, early, productive, evenly ripening and of commercial value.

Those in possession of such varieties will do well in not hastening too much to change them for others more advantageously spoken of because, in this instance, "One bird in your hand is worth two in the bush."

We would also advise growers of a same locality to cultivate, if possible, one variety, so that it may remain genuine and answer better the requirements of the trade.

Amongst the most recommendable varieties actually in favor both in the United States and in Canada, let us mention the following:

<i>White beans:</i>	White Pea (<i>Rond Blanc Commun</i>).
" "	Schofield Pea.
" "	Medium or Navy.
" "	White Wonder (<i>Merveille Blanche</i>).
" "	Pearce's Improved Tree.
" "	Marrowfat.
" "	White Kidney (<i>Rognon Blanc</i>).
<i>Yellow</i>	" Sulphur Yellow (<i>Jaune Soufre</i>).
<i>Spotted</i>	" Yellow-Eye (<i>Oeil-Jaune</i>).
" "	Black-Eye (<i>Oeil-Noir ou Saint-Esprit</i>).
<i>Red</i>	" Red Kidney (<i>Rognon Rouge</i>).

These varieties usually take from 107 to 115 days to mature and their yield usually reaches 15 to 25 bushels per acre (2).

Quantity of seed

This quantity varies in proportion of the particular development plants of certain varieties are supposed to reach, of the space left between the plants and between the rows, and of the size of the seeds used.

By following the method of seeding hereafter recommended, this quantity

(1) The length of the germinating power of the bean is three years. Then if the origin or age of seed beans was unknown, it would be wise to ascertain of their germinative capacity before putting them into the soil. For this purpose, plant 100 beans, in rows of 10, 1 inch in depth, in wet sand contained in a box measuring about 12" x 12". The number of plants that will come up after 5 to 7 days and their relative height will be reliable indications of the value and degree of vitality of the seed.

(2) All these varieties of bush beans to be shelled are generally classed, in America, in four groups or types, according as their seeds are reniform, ovoid or round, and according to the relation existing between their respective length and width, viz:

1. The *Kidney* type, including beans having the shape of a kidney;
2. The *Marrow* type of which the thickness of the seed exceeds half its length;
3. The *Medium* type of which the thickness of the seed is less than half its length;
4. The *Pea* type, or beans having the shape of the pea.

will be of $\frac{1}{2}$ to $\frac{3}{4}$ of a bushel per acre, for beans of the *Pea* and *Medium* types, and of 1 to $1\frac{1}{4}$, for those of the *Marrow* and *Kidney* types.

Planting

If the soil has been prepared as described previously, a new plowing will be sufficient when sowing-time has come.

In dry weather, and specially when a planter is to be used, this plowing

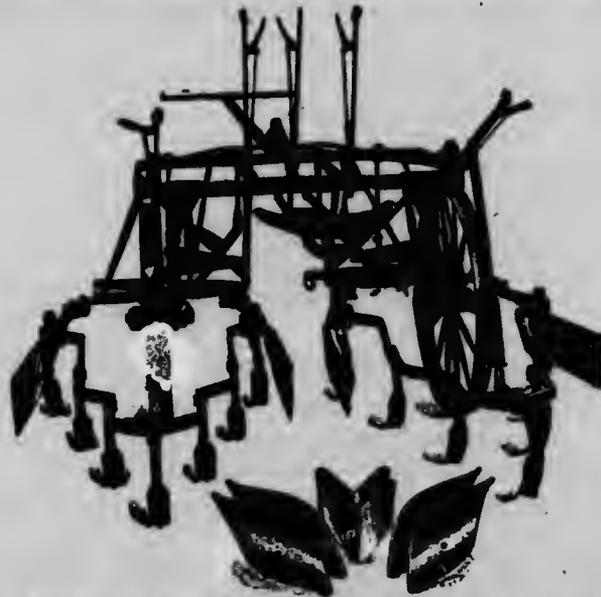


FIG. 6.—2 row "Planet Jr" Cultivator No. 72, with revolving wheel, plow and hiller.

should be followed by a good rolling which will have the effect of consolidating and levelling the ground.

Immediately after we will proceed to the planting which can be done by hand or with a planter.

Space between the rows.—In both cases, however, beans should be planted in drills (1) distant 28 inches one from the other, so that we may make further weedings and hillings with the horse cultivator.

Distance between the seeds.—The distance to be left between the seeds varies according to the vitality of the seed, the condition of the soil and the space required by plants of different varieties in order to reach their complete development. It is, as a rule, of 4 inches, though it may range from 3 to 6 inches.

Depth to plant.—As a general rule, the planting must be a shallow one in a rainy season, and deep in dry weather. When the season is fair and the

(1) Numerous experiments have demonstrated that it is much more advantageous to sow beans in *drills* than to plant them in hills or bunches.

ground in good shape, beans must not be buried in more than *two* inches of earth in light soils and *one* inch in compact soils.

Drill seeding with a planter.—In field cultivation, the sowing of beans must necessarily be made with a planter, if prompt and economical results are to be expected.

The various kinds of planters most in use for beans are:

10.—The hand seeder, Planet Jr No. 20, for beans and peas, which is very inexpensive and which, by the fact, is particularly intended for those who cannot afford to purchase a costly seeder for the planting of a rather small area (Fig. 1).

20.—The Massey-Harris horse planter, which renders efficient services and is particularly recommended for planting a ground of ordinary dimensions (Fig. 2).

30.—The Cockshutt two-horse planter, one of the most recommendable for sowing large areas (Fig. 3)

40.—Finally, the ordinary grain drills, and particularly the eleven tube one is considered as one of the most speedy for bean planting. Although it does not usually distribute the seeds in as a regular way as the two former seeders, it however has upon them the advantage of planting several rows at the same time. Thus the one with 11 tubes, 7 inch distant, will plant three rows at one time, 28 inches apart. The only thing to do will be to shut off the feeding tubes with the exception of the *second*, the *sixth* and the *tenth*, and to have the wheel follow the same furrow when coming back, so as to always keep the same distance between all rows (2).

Hand seeding.—When no planter is available, the seeding of a small area may be done by hand. Seeds are then distributed, distant as previously mentioned, in furrows drawn out by means of a marker, and afterwards buried with the back of a rake.

Rolling

The rolling not only has the effect of breaking, hardening and levelling the surface of the ground, but still has the moisture come to the top and places the seed in close contact with the particles of earth.

We shall consequently run the roller on the ground immediately after it

(1) The two latter seeders are equipped with fertilizer distributors and may be used for planting corn, beans or peas.

(2) This regular space between the rows would be very hard to obtain with a nine tube drill; for it being given that they would be 7 inches apart and that they would all be closed, except the 1st, 5th and 9th, we could not have the wheel come back in the same furrow, without reducing by one half the space between the outer rows planted in a contrary way. To remedy this, a marker would have to be attached to the drill, and this is just why the 11 tube machine must be given preference.

has been planted, if it was rather dry than wet at this moment, so as to favor the rapid germination of beans.

Cultivation

Hoeings and weedings.—When sown in a well-prepared and warmed up soil, beans generally come out after 8 to 10 days. If the weather was fair, one can wait until all the stalks appear above the ground to give the first hoeing (1). But if, in the 4 or 5 days following the plantation, rains would happen which might have the effect of hardening and crusting the surface of the soil, it would be useful to mellow it by a light plowing, provided however there would be no danger of breaking germs while operating; because the least injury would then be



FIG. 7.—Bean harvester

sufficient, if not to kill the germ which is very breakable, at least to provoke a stop of the growth that will be nothing but prejudicial.

We must not forget, in fact, that the growth of the bean must be maintained in a vigorous state during all the time of its vegetation, that is from planting time up to ripeness. For this purpose, hoeings and weedings will be made as

(1) In dry weather, hoeings are worth waterings, in mellow soils. It is of the highest importance to hoe on the eve of flowering-time, specially when the land is dry and in order to prevent the fall of flowers.

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often as necessary to keep the surface of the soil well loosened, clean, and to provide the plant with the amount of moisture required.

When a light soil has been given frequent cultivation (alternated plowings and rollings, hoeings), previous to plantation, the first hoeing will generally be given only about 15 days after sowing and the second, a few days prior to flowering-time.

In compact grounds, intermediate hoeings should be made after each rainfall, as soon as the soil will have sufficiently dried up, so as to prevent the forming of a crust at the surface.

If hoeings are necessary to hasten the growth, it is not any less important that they be superficial and not made when the foliage of bean plants is wet. Should the teeth of the hoe penetrate deep enough to reach the running roots, there would certainly result a diminution of the yield and quality of beans, because they are the very ones nourishing the fruits. We shall consequently, not come too close to the plants with the machine, when weeding. The work must be made by hand between each of the plants. Moreover, it would be favoring the development of rust on the plants than to weed or hoe them when wet.

It is particularly important to hoe frequently when the flowering-time is over, so as to destroy weeds, to prevent evaporation and to make the soil retain a sufficient amount of water to insure the plant with the food required to reach its full development: essential condition to have a good crop.

Hoeings and weedings are generally made with hand cultivators (Fig. 4), horse cultivators (Fig. 5), or with two-horse cultivators (Fig. 6), according to the importance or area of the crop.

Hilling.—As regards the profits to be derived by the plant, hilling up is not worth any more than hoeing. We would advise that it be done in the two following cases only: 1o to earth up the plants that might have been laid bare by the rain, in a light soil; 2o to facilitate the mechanical harvesting of the crop in a flinty soil. But we will never say too much to be careful about the roots.

Harvesting

Harvesting the crop.—One will recognize that beans have come to maturity, as soon as the leaves and pods are turning yellow, begin to dry and the seeds are hard enough to be difficultly penetrated with the finger nail. We will then hand pick the soundest and finest pods, store them carefully in a dry place, unshelled, because the first to ripen are those that afford the best seeds. The owners of genuine varieties would be well advised in always harvesting their seeds in this way; this is the safest means of obtaining first choice seeds.

Pulling up.—When most of the pods have matured, they will be pulled up, in dry weather, either by hand or mechanically.

Although the first process is much less expeditious than the second, it however has the advantage of reducing to their minimum the losses occasioned by shelling.

Hand pulling.—It consists in pulling one by one the bean plants and to gather them up, as the work is proceeding, in bunches which are left one after another in the field, where the pods will finish to ripen.

When they have thus been exposed to the sun during one day, they will be turned so as to dry up in an even manner, and they will next be collected in stacks 18 to 24 inches high. As soon as leaves are dry enough they will be taken into a dry and well ventilated room.

During these various operations, we must avoid shaking the pods too sud-

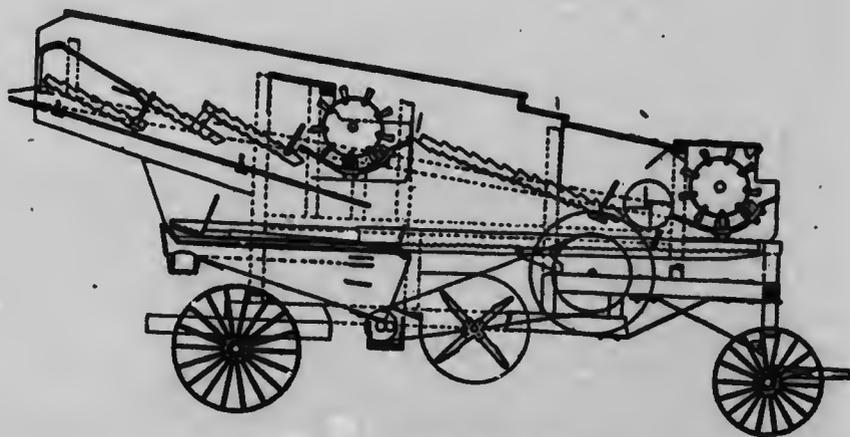


FIG. 8.—Bean thrasher (1).

denly, so as to prevent the loss of too much seed. Great losses would be avoided if care was taken to cover with a cloth the bottom of the wagon used in hauling the crop.

Mechanical pulling.—Figure 7 shows a bean harvester. This instrument can hardly be replaced if large crops are to be harvested economically. It consists in the very solid frame work of an ordinary cultivator, mounted on two wheels and fitted with two opposite knives adjusted in the shape of a V. Levers are provided in order to incline or bring them closer at will to cut off the roots of the beans on two rows at a time. These knives are themselves provided with rakes used in bringing back and distributing in a single windrow the leaves from the two rows

(1) Reproduction from Farmers' Bulletin, No. 289, U. S. A.

pulled. When in operation, men follow the puller and return, with forks, the windrows and put them up in stacks as already described.

In large growing centers, windrows are sometimes picked up by a side delivery rake instead of forks. It is obvious however that a greater loss of seeds is sustained.

As regards the drying and storing of bean crops, we must proceed as in the former case.

One of the most important points to observe, when harvesting, is to subtract, as far as possible, beans from the contact of the earth, as well as shelter them against storms, so that their seeds will not be spotted and may have a nice color. Some people recommend, for this purpose, the use of wooden or wire holders (racks) so as to isolate bean stacks from the soil. This process, sometimes advisable in small fields, is too expensive to be economically applied on a large scale.

Thrashing

In order to obtain beans that will not lose in weight and bulk, we must wait, before thrashing, until they have thoroughly dried in their pods. Thrashing may then be made with a flail or a special bean thrasher.

Flail.—Although the flail is recognized as the least bean cracking instrument its use is not a very saving one compared with the time required by thrashers to perform the shelling of an equal quantity of beans. Its use will consequently be advantageous only when the saving of time gained with a thrasher would not compensate the loss of beans that might be occasioned.

Ordinary thrasher.—Some argue that too much beans are cracked with it while others hold for the contrary. Many recommend the removal of a few teeth from the counter-thrasher or give them more distance, and to lower the speed of the cylinder, while others state having thrashed, with a similar machine, large quantities of Pea beans, without any appreciable loss having resulted.

What are we to conclude from these opinion discordances and of the different results obtained, if not that losses will be reduced as the seeds are smaller and that the discrepancies in the percentage of split beans probably depend on the degree of siccidity of beans as well as on the manner of feeding the thrasher.

Bean thrasher.—Fig. 8 represents the section of one of these modern machines used in localities where beans are grown on a large scale. It is formed of two cylinders run at different speeds. The first, situated at the front, shells the driest beans as they come, while the dry pods are carried, by the notches of an inclined plane, to the second cylinder operated at a much higher rate of speed, and which does not fail in separating the beans from the tougher pods.

This is the most satisfactory machine.

Cleaning and grading

After being sifted to rid them of foreign matter, beans are afterwards hand selected, if remunerative prices are to be obtained. When doing so, care must be taken to remove all discolored seeds, split, spotted, shrivelled, diseased or otherwise altered.

Sacking

Awaiting their sale, they are generally kept in heaps, in a dry and well ventilated place. Stored in a place somewhat damp, they would become mouldy.

When selling time has come, they are sacked in strong linen bags, with a capacity of two bushels or 120 pounds: beans weighing 60 pounds to a bushel.

Diseases and enemies

The bean has, both in the vegetable and animal kingdom, numerous enemies, the most harmful of which are:



FIG. 9.—Anthracnose.

Anthracnose.—Disease caused by a mushroom making itself known by the appearance of small round-shaped brown spots spreading and eating gradually all parts of the plant except roots. The disease usually originates from the planting of diseased seed. It then starts on cotyledons of the plant whose rapid destruction may be occasioned in rainy weather. If not, it spreads from cotyledons to leaves whose veins become black, thence to pods (Fig. 9) and seeds and finally, from one plant to another. This often results in considerable losses and in the danger of future crops being contaminated.

Rust.—Disease occasioned by a mushroom (*Uromyces Phascoli*). Its characteristic is the appearance on leaves and pods (Fig. 10), of small circular pustules, of a yellow color at first, but afterwards changing to a rusty brown and black. Though less to be feared than the former, it however depreciates the commercial value of bean crops, particularly in years of rain.

Bacteriosis.—Its coming into this country is quite a new one. It particularly attacks bush or dwarf varieties and is caused by a bacterium (*Pseudomonas Phascoli*). It generally appears on stems, leaves and specially fruits, during the very wet and hot days of August in the shape of greasy spots becoming cankerous, from which flows a visquous liquid promptly drying in surrounding itself with a pink border.

Remedies and Treatments.—These three diseases are more easily prevented than cured. The best preventives are the following:

- 1o. Only sound seed should be used. In case of doubt, it should be disinfected by a 45 minute immersion in a bath of formaline reduced to 1-200.
- 2o. Beans should not be grown two consecutive years on the same ground and we should avoid planting them in places partly shaded.
- 3o. Never cultivate the soil or slightly touch the foliage of bean plants when damp.
- 4o. Pull out and burn all diseased plants.
- 5o. A first spraying should be made with Bordeaux mixture before the blossom, and a second, 18 to 24 days after, making use of the formula 3-3-50, viz: 3 lbs of vitriol and 3 lbs of lime in 50 gallons of water (1).

These sprayings must be made in a very dry weather, when no rain is expected, with a sprayer. There are several kinds of spraying machines with insecticides and fungicides. Fig. 11 shows one of the most recommendable sprayers for potatoes, beans, etc., against diseases and insects, on average areas. It is fitted with a gauge so that the operator may spray at an even pressure. Nozzles can be adjusted at the required distance, upon a cross iron rod solidly fixed to the frame work of the pump.

Grey worms.—About ten different species are known of in the Province of Quebec. During the day, they hid under ground, one inch deep. They come out at night, looking for food, cut the young stems of plants and often work great havoc.

Destruction.—After sunset, spread around the plants, bran poisoned in the following manner: make a dry mixture of 20 lbs of bran with $\frac{1}{2}$ (one-half) lb. of Paris green. Dissolve one quart of molasses into 2 or 3 gallons of water, pour this sweetened water on poisoned bran and mix thoroughly.

Fresh cut clover could also be immersed for a couple of hours in a solution of Paris green (1 ounce in 1 gallon of water), and spread here and there between the rows.

Another excellent means consists in cleaning, after the crop, all bean wastes



FIG. 10.—Rust.

and remains from the surface of the soil, and in plowing deeply in the fall so as to occasion the killing of eggs and young worms

For a small garden.—One teaspoonful of Paris green; one tablespoonful of molasses; sufficient water and bran to make a consistent and homogeneous paste. Shorts may also be used instead of bran.

(1) Ask the Publications Service, Quebec Department of Agriculture, for bulletin No. 37, on Sprayings.

II.—CULTURE OF STRING BEANS

Importance

Of all the categories of crops enumerated in the first page, the most important and the less expensive is, unquestionably, the one previously treated, viz: the cultivation of bush beans for dry seeds. In fact, it does not occasion as high harvesting and shelling expenses as the other three the cost of production of which would still be higher, in the case of pole beans. Nevertheless, beans for the consumption of pods hold such an important place in the alimentation and are the object of so many different culinary preparations, that it is the interest of all people who can dispose of a small space for vegetable growing, to give them a good share of attention.

As for growers around the cities, they will derive valuable profits from this undertaking as long as the crops can be harvested at an early date and young helpers easily obtained for so doing.

1.—String beans

Are called string or snap beans, the green pods, long and slender, usually produced by membranous bush varieties, which are gathered when young, tender, fleshy, when the seeds are not yet formed, and constitute, once cooked, a much esteemed vegetable, much sought for on markets as well as for canning purposes.

Varieties.—Preference must be given to *membranous* (1) *bush varieties*, as they are the earliest. Amongst these, there are some the pods of which, first green, turn to a wax color when they have reached the required size to be eaten: they are called "*wax-podden beans.*" They have over the other "*green-podded*" varieties the advantage of being less filamentous, although a little more liable to diseases.

YELLOW POD BUSH VARIETIES

Early Mohawk	Bean.
Challenge (53 days)	"
Hudson wax	" (Beurre Hudson).
Davis' Kidney wax	" " (blanc de Davis).
Keeney's wax	" " (de Keeney)
Refugee wax	" " (Refugee).
Currie's Rust-Proof wax	" " (de Currie à l'épreuve de la rouille).
Scarlet Flageolet wax	" " (flageolet beurre rain).
Round Yellow of Six Weeks	" " (jaune hâtif de six semaines).
Burpee's Kidney	" " (rognon de Burpee).

GREEN POD BUSH VARIETIES

Long Yellow Six Weeks	Bean. (flageolet jaune).
Canadian or Crimson Wonder	" (flageolet rouge).
Stringless Green Pod	" (à cosse verte sans fil).
Burpee's Stringless Green Pod	" (à cosse verte sans fil de Burpee).
Extra Early Refugee	" (Refugee très hâtif).

(1) If, however, pole varieties for consumption when green were desired for planting, we would recommend the following:

- White Dutch Pole Bean (Sabre à rames).
- Flageolet Long Scarlet Pole Bean (Flageolet rouge à rames).
- Kentucky Wonder Bean (Merveille de Kentucky).

VARIETIES FOR CANNING PURPOSES

Stringless Valentine	Bean (Valentine sans fil).
Refugee	"
Mammoth Stringless Green Pod	" (à cosse verte sans fil de Mammoth).
Black of Belgium	" (Noir de Belgique).
Bagnolet	"

Cultivation.—Bush varieties of string beans are grown either in the field or garden, in the same manner as bush bean crops.

Picking.—Pods are usually good for consumption 53 to 65 days after planting, according to the precocity of varieties. They will be picked every two or three days—as vegetation will be more or less hastened by heat and dampness—when the required size has been reached. In doing so, the picking will last about fifteen days for wax beans, and about three weeks for string beans.

Owing to their precocity, bush beans have a tendency to mature quickly. Also, successive seedlings will have to be made every fifteen days, from May 25th to July 1st, if we want to be able to eat or sell some of them during the whole summer.

2.—Edible podded beans

Are called *edible podded beans*, *non-membranous bush* or *pole* varieties the pods of which are almost cylindrical and very fleshy and may be eat complete, from the moment seeds are formed until they begin to ripen.

YELLOW POD BUSH VARIETIES

Golden Wax	Bean (Beurre doré).
Detroit Wax	" " (Détoit).
Black Wax	" " (Noir).
Valentine Wax	" " (Valentine).
Golden Eye Wax	" " (Oeil Doré).
Wardwell Kidney Wax	" " (Rognon de Wardwell).
Improved Early Red Valentine	" " (Rouge hâtif).

GREEN POD BUSH VARIETIES

Dwarf Horticultural Bean (Haricot de Prague marbré nain).

Cultivation.—The same as for string beans.

YELLOW POD POLE VARIETY

Golden Carmine Bean (Haricot de Prague rouge).
Golden Cluster Bean " (Grappe dorée).

GREEN POD POLE VARIETY

Lazy Wife Pole Bean (Haricot Coco Blanc).

Culture of Pole Varieties.—*Requirements.* They require a richer soil than the previously named varieties and necessitate the use of stakes, props or poles, which is very expensive, so that they are more recommended as a garden crop.

As they extend much shadow when fully developed, they must be planted in some place of the garden where they will not interfere with other crops.

Planting.—The soil being deeply loosened, 7 to 9 ft high stakes or poles (1) are driven into the ground, three or four feet distant in all directions, at the foot of which are sown in drills or hills, 4 or 5 bean seeds afterwards covered with 1 to 1½ inch of earth mixed with compost, if possible.

As soon as beans will come out and leaves form, they must be hoed, banked up and fixed to poles. They could also be sown in hills, one foot distant, on beds of three rows 1½ ft apart and oriented north-south, providing for a 3 ft path between each bed. In this case, poles will be driven into the ground only when beans spring up and far enough from the foot of each plant so as not to break the roots. On the rows bordering the alleys, care will be taken to drive in the pole between the plant and the alley, so as to guard it against trampling.

To consolidate the poles which, in both cases, would run the risk of being sent down by strong winds, we drive in between the rows, at the extremity of beds, strong stakes joined by stretched wires upon which the end of the poles is tied.

Another process that does away with the use of poles, consists in firmly driving in at the end of rows, at every 20 ft distance, posts connected by two No 10 wires, one stretched 1 ft above the ground and the other, 4 or 5 ft higher. These wires are afterwards joined together by tarred strings stretched angularly or in the shape of a saw-tooth, opposite every bean stalk.

Cultivation.—It mostly consists in hoeing and weeding the plants when needed, to water in dry weather so that flowers will not burn neither leaves dry up.



FIG. 11.—Sprayer.

Picking.—The picking of pods must take place every two or three days as stated previously.

(1) The most recommendable stakes, props or poles are branches or young birch trunks, about 1 to 1½ inch in diameter and having their bark on.

3.—Green shell beans

The cultivation of special varieties of beans for the production of grains to shell when green belongs to the market domain rather than the kitchen-garden. In fact those who plant in the field or garden, varieties of white shell beans for the production of strings or dry seeds, could also obtain green shells providing the picking is made at the proper time, that is, as soon as the pods are turning yellow.

As regards growers of beans for the seasonable supply of cities, they will be well advised in securing special varieties that are shelled easily before full ripeness, and whose seeds will keep their green color, even when the bunches have been pulled out (1).

The most recommendable *varieties* for green shell crops are the following:

Dwarf Horticultural Bean (Haricot de Prague marbré nain).
Goddard "
Flageolet white and green Bean (flageolets blancs et verts).

III.—EARLY BEAN CROPS

Sow in bed and in nursery around April 20th; prick out twice in nursery; take back in pots buried into the bed; choke to hasten retaking and do so more and more. If weather permits, remove sashes to harden the plants; plant to stay in the garden at spaces already mentioned, about the 1st of June.

IV.—LATE BEAN CROPS

It very often freezes by the end of August and it is for this purpose that beans are not sown that might be in bloom at this time. So as to lengthen this culture, it would be sufficient to keep them covered, during this rather short period of frost, with cloths or mats.

V.—METHOD OF CONSERVATION

String and edible podded beans.—Pods fresh picked are classified as to size, then cut at their two ends, to remove the too strong taste of green. They are then soaked about five minutes in boiling water from where they are taken out and plunged immediately into cold water, so as to coagulate albuminous matters and have them retain their green color. After this has been done, they will be packed close, in overlapping layers, into earthenware pots or large neck glass jars, brinck being also poured in (2 lbs of salt to 1 gallon of water). When the recep-

(1) To do this, it is only sufficient to pull out beans, when the weather is fair, before they are fully ripe, and to collect them in bunches which are left to dry gradually in the shadow in a dry and well ventilated place. In the absence of a room large enough to receive the crop, bunches might be set up on stakes (3 stakes planted in X), and covered with straw or hay-shock cloths so as to free them from the direct rays of the sun and to protect them against the inclemencies of the weather. Seeds will thus ripen gradually and will remain green.

tacle has been well filled in this way, it will be sealed air-tight. Boiling in plenty of water for about ten minutes will be sufficient to make these pods just as eatable as if fresh picked.

For large quantities, one would only have to operate in the same way using very clean barrels instead of pots or jars. However in this case care should be taken to completely immerge pods into brink so that they will not come in contact with air on the surface of the liquid.

They could be kept just as well in salt, dry, instead of being immersed into brine.

VI.—CULINARY PREPARATION OF BEANS

Fresh picked beans from the garden.—Break both ends and blanch in boiling water during 5 to 10 minutes to remove the strong green taste, then put again into hot water and leave them in until fully cooked. Then, remove from the water and set to drain; put a little butter in a stewpan or frying-pan. When butter is very hot, fry beans, cut a small quantity of parsley, garlic, cibol, add pepper and salt and remove from the fire. They are eat with roasted meat; pork or mutton chops. Serve hot altogether.

String beans are also prepared in another way: make a white sauce, put butter in a frying-pan or stewpan, add a spoonful of butter according to the quantity of beans to be cooked.

Take the yolks of two eggs in a bowl, pour a little of your boiling liquid with one hand while with a wooden spoon in the other you stir hard until your yolks are well mixed with the liquid you will have poured. Then pour the contents of your bowl into the sauce you are preparing. After a few minutes, pour the whole on the beans cooked in advance.

String beans are again otherwise used, specially in soups *à la Julienne*, mixed with other vegetables.

String beans, canned, are prepared in a similar way except that it is not necessary to have them lose their taste of green, as this will have already been done.

Green shell beans.—They are short boiled, that is simply put in water and left on the fire until thoroughly cooked; they are consumed with mutton legs or other roasted parts.

Dry shell beans are prepared with pork or in soup: cook during 3 or 4 hours, crush and sift to remove skins, then put again on the fire for 10 or 15 minutes and serve with crusts.

REMARK.—Methods in use to fight the enemies of beans to be consumed green are the same as those recommended for dry shell beans, with this difference, however, that sprayings will be stopped as soon as snaps will form.

